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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/622,690	07/21/2003	Jui-Hua Fang	0941-0798P	4410

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EXAMINER

LEE, CALVIN

ART UNIT	PAPER NUMBER
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2825

DATE MAILED: 03/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/622,690

Applicant(s)

FANG ET AL.

Examiner

Lee Calvin

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

OFFICE ACTION***Drawings***

1. Figure 3 is objected to as failing to comply with 37 CFR 1.84(p)(5) because it includes reference "S104" not mentioned in the description. A corrected drawing, or amendment to the specification to add the reference sign in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. Claims 12 and 15-17 are objected to because of the following informality:

Claim 12, line 4 and claims 15-17, line 2, after "semiconductor" insert --substrate--

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 9 and 19-20 are rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. There is no support related to such: "the thermal treatment and a plasma treatment are performed", "the nitrogen-containing gas and a thermal treatment are treated simultaneously", or "the nitrogen-containing gas and a plasma treatment are treated simultaneously".

Claim Rejections - 35 U.S.C. § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 3-8, 10-12, 14, and 16-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Ng (US 5,994,217).

Ng discloses a method of modifying a conductive wiring, comprising the steps of:

- forming a first barrier Ti/TiN **24, 28** on a semiconductor substrate **10** [Figs. 1 and 6]
- forming a wiring **32** of Al/Si/Cu sandwiched between the first barrier and a second barrier **34**
- performing a thermal treatment in nitrogen after forming the conductive wiring [col. 4, ln.30] and after forming TiN of the second barrier [col. 4, ln.59]; wherein the treatment is performed by baking from room temperature to a high temperature of about 450°C, and by quenching from a high temperature of about 450°C to a low temperature of about 25°C [Fig. 3] (meet claims 10-11)

Claim Rejections - 35 U.S.C. § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 2, 13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ng in view of *Kim et al* (US 2002/0187631).

a) In re claims 2 and 13, Ng discloses the first barrier comprised of a stacked Ti/TiN, but not the second barrier. *Kim et al* teaches a similar wiring sandwiched between first and second barriers, wherein the second barrier comprises a stacked layer of Ti/TiN [Fig. 11].

It would have been obvious to one of ordinary skill to have modified the second barrier of Ng by utilizing a stacked layer of Ti/TiN in the case that the second barrier will be used not only as a diffuser/barrier but also an ARC (anti-reflection coating), taught by Ng's reference [see Abstract].

b) In re claim 15, Ng is silent about the nitrogen-containing gas is treated with the substrate before forming the conductive wiring. Nevertheless, such treatment using a nitrogen-containing gas is known in the semiconductor processing art as evidenced by *Kim et al* disclosing "the nitrogen source chemical might react with the titanium metal (deposit at step 194) and convert the titanium metal into titanium nitride" [paragraph 0063]. Moreover, *Kim et al* also suggest "anneal may be carried out immediately following deposition of the first reactive metal layer, or after the deposition of a subsequent reactive metal and/or further metal nitride layer" [paragraph 0065].

It would have been obvious to one of ordinary skill to have modified the process of Ng by utilizing nitrogen treatment of a barrier for the purpose of "compounding with the reactive metal (i.e., conductive wiring) in the grain boundaries" [paragraph 0064 in *Kim et al*].

Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 from 7:00 to 17:00 (Monday-Thursday). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* can be reached at (571) 272-1907.

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The fax phones are (703) 872-9318 for regular communications and (703) 872-9319 for After-Final communications.

CL

March 4, 2004


CARIDAD EVERHART
PRIMARY EXAMINER